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CLAIMS

1.   A method of measuring the partition coefficient of a
compound between two immiscible solvents, said method
comprising the steps of:

a) providing a composition which contains said compound
and comprises nanoparticles having a porous surface and a
first solvent, wherein a second solvent is absorbed into the
pores of the nanoparticles and wherein said first and second
solvents are immiscible;

b) separating the product of step a) into two components,
the first comprising the nanoparticles and the second
comprising the solvent; and

c) determining the partition coefficient from the
partition of the compound between said first and second
components.

2.   A composition comprising nanoparticles having a porous
surface and a first solvent, wherein a second solvent is
absorbed into the pores of the nanoparticles and wherein said
first and second solvents are immiscible.

3.   A composition according to claim 2 wherein said
nanoparticles form a colloidally stable suspension in said
first solvent.

4.   A composition according to claim 2 or 3 wherein said
porous surface is formed of any one of silica, alumina,
titania, zirconia or carbon.

5.   A composition according to any one of claims 2 to 4
wherein the nanoparticles further comprise a magnetic material
core.

6.   A composition according to claim 5 wherein said magnetic
material core is formed from magnetite (Fe_3O_4), maghemite
(γFe_3O_4), greigite (Fe_3S_4), Fe_2CoO_4, a ferromagnetic metal or
alloy or carbide.

7.   A composition according to any one of claims 2 to 6
wherein said nanoparticles have a diameter of between 2nm and
$1\mu m$.

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8. A composition according to any one of claims 2 to 7 wherein the porous surface layer of said nanoparticles has a thickness of between 1nm and 100nm.

9. A composition according to any one of claims 2 to 8 wherein said first solvent is aqueous, particularly is water.

10. A composition according to any one of claims 2 to 9 wherein said second solvent is one of n-octanol, cyclohexane, a C_6 - C_{10} alkane, chloroform, propylene glycol dipelargonate (PGDP), 1,2-dichloroethane, olive oil, benzene, toluene, nitrobenzene, chlorobenzene, tetrachloromethane, oleyl alcohol, 4-methylpentan-2-ol, pentan-1-ol, pentan-2-ol, isobutanol, butan-1-ol, 2-methylbutan-2-ol, butan-2-ol, butan-2-one, diethyl ether, isoamyl acetate, ethyl acetate, etc. or a monophasic mixture of two or more of these.

11. A composition according to any one of claims 2 to 10 wherein the volume ratio of said first solvent to said second solvent is between 3000:1 and 1:1 (preferably in the range 500:1 to 50:1).

12. A composition according to claim 11 wherein the ratio of said first solvent to said second solvent is at least 100:1.

13. A method of attaining partition of a compound between two immiscible solvents comprising incorporating said compound in a composition according to any one of claims 2 to 12.

14. A composition for use in a quantitative analytical technique, comprising nanoparticles each having a porous surface and a solvent adsorbed in the pores of the nanoparticles in a predetermined amount per unit weight of the composition.

15. A composition according to claim 13, wherein said porous surface is formed from any one of silica, alumina, titania, zirconia or carbon.

16. A composition according to claim 14 or 15 wherein the nanoparticles each have a magnetic material core.

17. A composition according to any one of claims 14 to 16 wherein said solvent is immiscible with water.

18. A composition according to claim 17 wherein said second solvent is one of n-octanol, cyclohexane, a C_6 - C_{10} alkane,

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chloroform, propylene glycol dipelargonate (PGDP), 1,2-
dichloroethane, olive oil, benzene, toluene, nitrobenzene,
chlorobenzene, tetrachloromethane, oleyl alcohol, 4-
methylpentan-2-ol, pentan-1-ol, pentan-2-ol, isobutanol,
butan-1-ol, 2-methylbutan-2-ol, butan-2-ol, butan-2-one,
diethyl ether, isoamyl acetate, ethyl acetate, etc. or a
monophasic mixture of two or more of these.

19.   Use of a composition according to any one of claims 14 to
18 in a method of determining a partition coefficient.

20.   A method of measuring the partition coefficient of a
compound between two immiscible solvents, said method
comprising the steps of:

     a) incorporating said compound in a composition according
to any one of claims 2 to 13;

     b) separating the product of step a) into two components,
the first comprising the nanoparticles and the second
comprising the first solvent; and

     c) determining the partition coefficient from the
partition of the compound between said first and second
components.

21.   A method according to claim 1 or 20 wherein step c)
comprises determining the amount of said compound which
remains in said first solvent.

22.   A method according to claim 1, 20 or 21 wherein said
compound is a bioactive drug molecule.

23.   A method according to any one of claims 1 and 20 to 22
wherein step b) is performed by any one of filtration,
centrifugation and magnetic separation.

24.   A method according to any one of claims 1 and 20 to 23
wherein step c) comprises recording the UV-visible spectrum of
said supernatant solution.

25.   A method according to any one of claims 1 and 20 to 24
further comprising shaking the composition of step a) prior to
performing the separation step b).

26.   A nanoparticle having a core comprising a catalytically
active species, and a porous layer surrounding the core which

has a pore size such that the catalytically active species is
entrapped.

27. A nanoparticle according to claim 26 wherein said core
catalytically active species is a biologically active species,
e.g. an enzyme or other protein.

28. A nanoparticle according to claim 27 wherein said
biologically active species is any one of blood serum albumin,
β-Lactamase I (Penicillinase),kinase, a carboxylesterase,
metallothionin, cytochrome b, c, P450, etc.

29. A nanoparticle according to any one of claims 26 to 28
wherein said porous layer is formed from any one of silica,
alumina, titania, zirconia or carbon.

30. A nanoparticle according to any one of claims 26 to 29
wherein said core further comprises a magnetic material.

31. A nanoparticle according to claim 30 wherein said
magnetic core is formed from magnetite (Fe_3O_4), maghemite
(γFe_3O_4), greigite (Fe_3S_4) or Fe_2CoO_4 or ferromagnetic metal or
alloys (such as Fe-Pt, Fe-Co, Fe-Ni), metal carbides, etc.

32. A nanoparticle according to any one of claims 26 to 31
wherein said nanoparticles have an average a diameter of
between 2nm and 1μm.

33. A nanoparticle according to any one of claims 26 to 32
wherein the core of the nanoparticle has an average diameter
of between 1 and 10 nm.

34. A nanoparticle according to any one of claims 26 to 33
wherein the porous outer coating on said nanoparticle has a
thickness between 1nm and 100nm.

35. An assembly of nanoparticles at least some of which are
nanoparticles according to any one of claims 26 to 34, wherein
on average the number of molecules of said catalytically
active species per nanoparticle of the assembly is not more
than one.

36. A method of making a nanoparticle according to any one of
claims 26 to 34, comprising the following steps:

    a) forming, in a liquid medium, colloidal particles
containing the catalytically active species to be contained in

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the nanoparticle core, the particles being colloidally
stabilised by a surfactant;

b) treating said colloidal particles by hydrolysis or
pyrolysis to form the porous layer surrounding the
5   catalytically active species.

37.   A method of claim 36 wherein, in step a), said colloidal
particles further contain a magnetic material or a precursor
to a magnetic material.

38.   A method of claim 36 or 37 wherein said colloidal
10   particles comprise aqueous colloidal particles in a solvent
which is immiscible with water.

39.   A method of claim 38 further comprising adding a salt of
silicon, aluminium, titanium or zirconium to the product of
step a), which forms the corresponding oxide compound upon
15   hydrolysis at the colloid boundary.

40.   A method of claim 39 wherein said silicon salt is
tetraethyl orthosilicate (TEOS) and the surfactant is
cetyltrimethylammonium bromide (CTAB).

41.   A method of depositing a component in pores of a porous
20   material, by contacting the porous material with a solution of
the component in a supercritical fluid.

42.   A method according to claim 41 wherein the supercritical
fluid is removed by depressurising it and allowing it to
evaporate.

25   43.   A method according to claim 1 or 2 wherein the component
is a liquid.

44.   A method according to any one of claims 41 to 43 wherein
the component is substantially insoluble in water.

45.   A method according to any one of claims 41 to 44 wherein
30   the porous material is porous particles.

46.   A method according to claim 45 wherein the porous
particles are nanoparticles, having a particle size not
greater than 1μm.

47.   A method according to any one of claims 41 to 46 wherein
35   the porous material has a porous silica surface.

48.   A method according to any one of claims 41 to 47 wherein
the supercritical fluid is carbon dioxide.

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49.   A method of preparing a composition containing two
components comprising preparing porous particles containing a
first component in a predetermined amount by a method
according to claims 45 to 48, and adding said particles to a
5   liquid second component.
50.   A method according to claim 49 wherein the first and
second components are immiscible.